Cont A4

18. (new) Method as defined in claim 6, wherein the cellulose fibre is refined in non-gel form.

19. (new) Paper pulp as defined in claim 10, wherein the noil fibrils are in non-gel form.

REMARKS

Claims 1-19 are pending in the patent application. Claims 1-16 have been amended. New claims 17-19 have been added. No new matter has been added.

Claims 3, 4, 8, 12 and 13 have been amended to remove multiple dependence.

Claims 4, 5, 8, 9, 13 and 14 were objected to for containing a mathematical symbol and for incorrectly referring to the Schopper number. The mathematical symbols have been replaced by the words "greater than." Furthermore, the Examiner required that the Schopper number be referred to as the "Schopper-Riegler" number and that the units be presented in degrees. Applicant respectfully asserts that the term Schopper-Riegler number is adequate for one of ordinary skill in the art to understand. For example, the enclosed copy of the Schopper-Riegler standard (Published by the Scandanavian Pulp, Paper and Borad, Testing Committee, 1964) refers, in the definition section, to the "Schopper-Riegler (SR) number". Accordingly, since it is accepted practice to use the term Schopper-Riegler number, this term has been left in the claims. It is believed that these changes to claims 4, 5, 8, 9, 13 and 14 do not affect the scope of these claims.

Claims 1-16 are rejected under 35 U.S.C. § 112, second paragraph for being vague and indefinite. In particular, the Examiner objected to the use of the word "mainly". This has been removed and replaced with the term "substantially", which is believed to be clear and definite, according to MPEP § 2173.05(b).

It is stated in the Office Action that claims 1-7 and 10-11 are indefinite because the terms P50 and P100 do not define the sieve screen used. Applicants respectfully assert that the claim language is not indefinite. The terms P50 and P100 refer to

material that is passed through a 50 mesh and a 100 mesh screen respectively. Accordingly, the terms P50 and P100 are not indefinite.

It was stated in the Office Action that claim 10 was indefinite because it did not indicate what other noils were employed. The phrase "if desired, other kinds of noil" was used to indicate that the paper pulp of claim 10, while necessarily having the type of noil that is the subject matter of the claim, may also include other types of noil. This phrase has been deleted, to remove any indefiniteness. Applicant notes that claim 10 is written in open form, and respectfully asserts that the amended form of claim 10 has not been narrowed by the amendment, and that the paper pulp of the type claimed in claim 10 may also include other types of noil.

It is stated in the Office Action that claims 15 and 16 are indefinite since the steps of using the noils have not been recited. Applicant respectfully contends that no method steps need be recited. Claim 15 is a product claim and is directed to paper formed using the noil as defined in claim 1. Claim 16 is a product claim and is directed to paper formed using the paper pulp as defined in claim 10. Since the paper of claim 15 is uniquely defined by the noil of claim 1 and the paper of claim 16 is uniquely defined by the pulp of claim 10, there is no need to recite method steps.

It is believed that all claims comply with 35 U.S.C. § 112, second paragraph.

Claims 1-16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over either Gavelin (U.S. Patent No. 4,889,594) or Roberts (U.S. Patent No. 4,692,211).

Gavelin teaches a method of manufacturing filler containing papers in which filler and refined fine pulp are mixed and then added to the pulp. The retention and technical properties of the paper are enhanced by coflocculating the filler with fine pulp which contains a high proportion of fine fraction (which passes through 150 mesh Bauer McNett screen) with the aid of retention agents. The best results, from the forming and retention aspect, are obtained by subjecting the flocs generated to a size-controlling shearing process in which large flocs (4-7mm) are broken down and small flocs are (around 2mm, for example, 0.1-1 mm) are agglomerated. A suitable floc size is 2.5-3.6 mm.

Roberts teaches high strength cellulosic paper in which a refined kraft papermaking pulp is mixed with hydrated cellulosic gel.

The invention of claim 1 is directed to a noil for use in paper manufacture, where the is mixed in paper pulp. The noil is produced cellulose fibre by refining and consists of noil fibrils which, in respect of in size distribution, substantially correspond to a wire screen fraction P50. The noil constitutes 0.1 –15 w-% of the paper pulp.

The invention of claim 6 is directed to a method for producing noil for use in paper manufacture. According to the method, the cellulose fibre is refined so as to form noil fibrils that, in respect of size distribution, substantially correspond to wire screen fraction P50.

The invention of claim 10 is directed to paper pulp for use in paper manufacture, containing cellulose fibre and/or mechanical pulp fibre, and filler. The paper pulp contains noil that has been produced from cellulose fibre by refining and consists of noil fibrils substantially corresponding in size distribution to wire screen fraction P50 and that the noil constitutes 0.1 – 15 w-% of the paper pulp.

Three criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference. Second, there must be a reasonable expectation of success. Finally, the prior art reference, or combination of references, must teach or suggest all the claim limitations. MPEP § 2142. Applicant respectfully traverses the rejection since the prior art fails to disclose all the claim limitations and there would be no motivation to modify the references as proposed by the Examiner.

It is useful first to discuss the meanings of various terms used in this response. The term "40-100 ml CFS" means in Schopper-Riegler (SR) scale a Schopper-Riegler number between 70-85. Copies of CFS and SR standards (published by the Scandanavian Pulp, Paper and Board Testing Committee, 1964 and 1965) are enclosed with this response, along with a copy of a conversion curve for converting between CFS and SR units.

50/100/150 mesh Bauer McNett means 50/100/150 mesh wire screen. The term "P" in front of the wire screen size means "passed" and "R" means "rejected". Thus P50 indicates material that is passed by the 50 mesh Bauer McNett screen. It is difficult to convert Bauer McNett values directly into SR or CFS values because the values are

dependent on various factors, such as the ion content of the water used in the measurements.

The present invention differs from the Gavelin's method in the size distribution used. All the fractions and floc sizes mentioned by Gavelin would be retained in the Bauer McNett P50 wire screen, rather than passed through the screen. The Office Action admits that Gavelin's particles between 0.5-1 mm, described at col. 3, lines 43-66, would be retained by a 50 mesh screen, rather than passed by the screen. Thus, Gravelin does not teach or suggest the elements of the invention as claimed in the Office Action, and the use of P50 material would not result simply from a simple optimization process of Gravelin's teaching.

An advantage of the present invention is that the noil can be mixed in the paper pulp, i.e. without coflocculating the pigment and noil and subjecting the flocs to a floc size-controlling shearing process. Another advantage of the present invention is that there is no need for retention agents when binding the pigment to noil fibrils: the character of the fibrils is such that pigments and fibrils are "entangled" together without retention agents. Thus the paper according to the invention easier and cheaper to manufacture.

To further indicate the differences between Gravelin's method and the present invention, It is useful to consider the differences between the papers produced according to the present invention and that produced using Gavelin's method. According to Gavelin's example 1, Gavelin's method improves the tensile index from 26.4 to 37.2 kNm/kg, corresponding to an increase in the tensile index of only about 41 %. The method according to the present invention, on the other hand, improves the tensile index from 25 to 40 kNm/kg, corresponding to an increase of 60 %. Simultaneously the presently claimed paper increases the light-scattering coefficient from 58 to 63 m2/kg, corresponding to an increase of 9%. Gavelin reports no increase in the brightness of the paper. Thus, use of the present invention results in a paper having improved strength and optical properties, while Gavelin's method improves only the strength. Accordingly, Applicant contends that it would not be obvious to modify Gravelin in the manner proposed in the Office Action, to achieve the results of the

claimed invention. Thus, claims 1-16 are not obvious in view of Gavelin and are allowable.

Roberts fails to disclose the size distribution of noil fibrils in sellulosic gel. The aim of Robert's method is to improve the strength properties of kraft paper; improved optic properties are not disclosed. Applicant respectfully asserts that it would not be obvious that a paper with both improved strength and improved brightness would be obtained from using P50 material as claimed, and that such improvement in these two different paper properties is unexpected.

New claims 17-19 are directed to the noil fibrils being in non-gel form. For example, the method of manufacturing the noil fibrils presented on page 6, lines 15-34 produces non-gel noil fibrils.

In view of the amendments and reasons provided above, it is believed that all pending claims are in condition for allowance. Applicant respectfully requests favorable reconsideration and early allowance of all pending claims.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact the below-signed attorney, Iain A. McIntyre at 952.253.4110.

Altera Law Group, LLC
6500 City West Parkway, Suite 100
Minneapolis, MN 55344-7704
952.253.4110

Date: August 5, 2002

By:

Iain A. McIntyre
Reg. No. 40,337
IAM/mar

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Appendix A

Marked Up Version of the Entire Claim Set

1. (Once Amended) Noil for use in paper manufacture, said noil being mixed in paper pulp, characterised in that the noil has been produced from cellulose fibre by refining and consists of noil fibrils which, in respect of in size distribution, [mainly] substantially correspond to wire screen fraction P50, and that the noil constitutes 0.1 – 15 w-% of the paper pulp.

2. (Once Amended) Noil as defined in claim 1, characterised in that the noil fibrils [mainly] substantially correspond to wire screen fraction P100.

3. (Once Amended) Noil as defined in claim 1 [or 2], characterised in that the paper pulp contains pigment, the mass ratio of pigment to noil being 0.1 – 20.

4. (Once Amended) Noil as defined in claim 1 [any one of claims 1-3], characterised in that the noil has been produced by refining cellulose fibre to a Schopper-Riegler number [>] greater than 80.

5. (Once Amended) Noil as defined in claim 4, characterised in that cellulose fibre has been refined to a Schopper-Riegler number in the range 85 – 90.

6. (Once Amended) Method for producing noil for use in paper manufacture, characterised in that cellulose fibre is refined so as to form noil fibrils that, in respect of size distribution, [mainly] substantially correspond to wire screen fraction P50.

7. (Once Amended) Method as defined in claim 6, characterised in that the noil fibrils [mainly] substantially correspond to wire screen fraction P100.

8. (Once Amended) Method as defined in claim 6 [or 7], characterised in that the noil is produced by refining cellulose fibre to a Schopper-Riegler number [>] greater than 80.

9. (Once Amended) Method as defined in claim 8, characterised in that cellulose fibre and/or mechanical pulp fibre is/are refined to a Schopper-Riegler number in the range 85 – 90.

10. (Once Amended) Paper pulp for use in paper manufacture, containing cellulose fibre and/or mechanical pulp fibre, and filler [and, if desired, other kinds of noil], characterised in that the paper pulp contains noil that has been produced from cellulose fibre by refining and consists of noil fibrils [mainly] substantially corresponding in size distribution to wire screen fraction P50 and that the noil constitutes 0.1 – 15 w-% of the paper pulp.

11. (Once Amended) Paper pulp as defined in claim 10, characterised in that the noil fibrils [mainly] substantially correspond to wire screen fraction P100.

12. (Once Amended) Paper pulp as defined in claim 10 [or 11], characterised in that the paper pulp contains pigment, the mass ratio of pigment to noil being 0.1 – 20.

13. (Once Amended) Paper pulp as defined in claim 10 [any one of claims 10-12], characterised in that the noil has been produced by refining cellulose fibre to a Schopper-Riegler number [>] greater than 80.

14. (Once Amended) Paper pulp as defined in claim 11, characterised in that cellulose fibre has been refined to a Schopper-Rielger number in the range 85 – 90.

15. (Once amended) Paper manufactured using noil as defined in claim 1 [any one of claims 1-5].

16. (Once Amended) Paper manufactured using paper pulp as defined in claim 10 [any one of claims 10-14].

17. (new) Noil as defined in claim 1, wherein the noil fibrils are in a non-gel form.

18. (new) Method as defined in claim 6, wherein the cellulose fibre is refined in non-gel form.

19. (new) Paper pulp as defined in claim 10, wherein the noil fibrils are in non-gel form.

Appendix B
Marked Up Version of the Amended Paragraphs of the Specification

The changes to the paragraph starting at page1, line 4 are as follows:

The present invention relates to noil for use in paper manufacture[, as defined in the preamble of claim 1]. Moreover, the invention relates to a method for producing such noil and to paper pule and paper containing <u>the noil</u> [it].

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21/09 '01 PE 14:18 FAX 358 10[redacted]412 M-S CORP R&D [redacted]ttachment A

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SCANDINAVIAN PULP, PAPER AND BOARD
TESTING COMMITTEE

SCAN-C19:65

Accepted - October 1964
Identical with SCAN-M3:65

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→ Erja Partio (09) 34800630
From: Petri Silenius, M-real

DRAINABILITY OF PULP BY THE SCHOPPER-RIEGLER METHOD

Definition

The Schopper-Riegler (SR) number of a pulp is a measure of the drainability of a suspension of pulp in water, determined and expressed as specified in this method.

Scope

This method is applicable to any kind of pulp with the limitations indicated in Note 1.

Principle

A known volume of pulp in aqueous suspension is drained through the fibre mat, formed on a wire screen during the test, into a funnel provided with a bottom and a side orifice (*Figure* 1). The filtrate collected from the side orifice is measured in a special cylinder, graduated in SR units. A discharge of 1000 ml corresponds to zero SR units, and zero discharge to 100 SR units. One SR unit thus corresponds to 10 ml.

Apparatus

1. Schopper-Riegler apparatus of the design and in the condition specified in Appendices A and B, respectively.
2. Measuring cylinder graduated in SR units (Appendix A).

Preparation of sample

Disintegrate a sample of mechanical pulp as described in SCAN-M 2 and of chemical pulp as described in SCAN-C 18 and dilute the suspension so obtained to approximately 2.2 g per litre. Determine the stock concentration by the procedure in SCAN-M 1 or SCAN-C 17. Avoid the formation of air bubbles in the suspension. Dilute the pulp suspension to 2.00 g ± 0.02 g of oven-dry pulp per litre and adjust its temperature to 20.0° C ± 0.5° C. Throughout the test use distilled, deionized or otherwise purified water that gives results equivalent to those obtained with distilled water (Note 2).

Procedure

Clean the funnel and drainage chamber of the apparatus thoroughly, rinse finally with water and place the drainage chamber in the seat of the funnel. Adjust the temperature of the apparatus by rinsing it with water at 20.0° C ± 0.5° C. Place the sealing cone in the closed position and place the SR-measuring cylinder beneath the side orifice. While stirring, transfer 1000 ml ± 5 ml of homogeneous pulp suspension to a measuring cylinder. Agitate the pulp suspension in the cylinder and pour it rapidly but smoothly into the drainage chamber. Direct the stream against the shaft and the wings of the sealing cone to avoid a vortex. Raise the sealing cone 5 s after all the pulp suspension has been added. Read the SR number to the nearest unit when no more water drips from the side orifice.

Make two determinations on each sample. The results should not differ by more than 4 %. If they do, make another pair of determinations. The number of determinations to be performed may also be calculated as described in SCAN-G 2, Section: "Number of observations."

Report

For each sample report the mean SR number to the nearest unit. If the sample was received in slush form, state the concentration and the origin of the water used to form the slurry.

If water other than that specified above is used for the test, this fact must be stated with the test results (Note 2).

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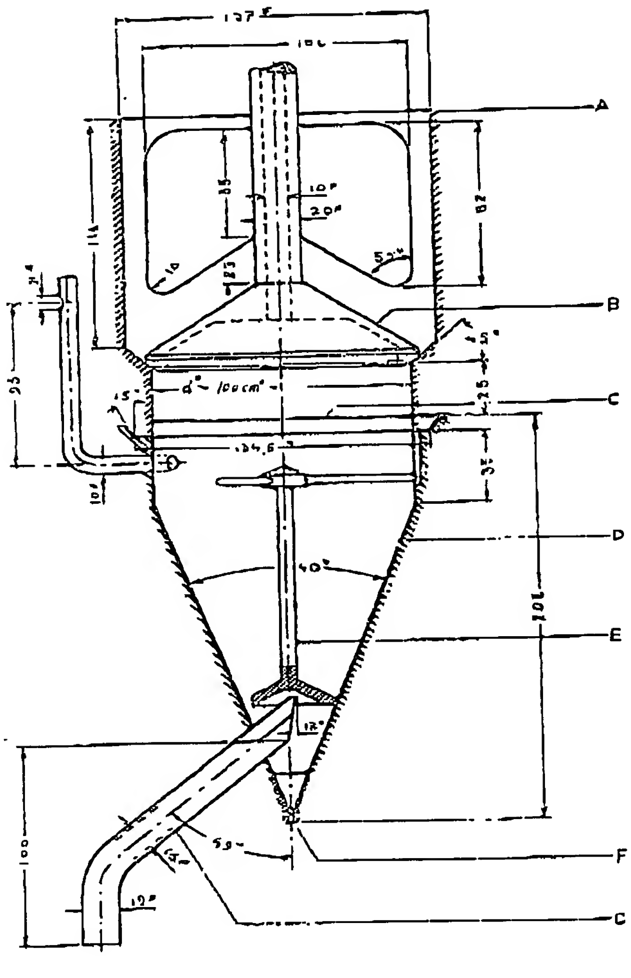

Figure 1. Schopper-Riegler apparatus.

A = drainage chamber
B = sealing cone
C = wire screen
D = funnel
E = spreader cone
F = bottom orifice
G = side orifice

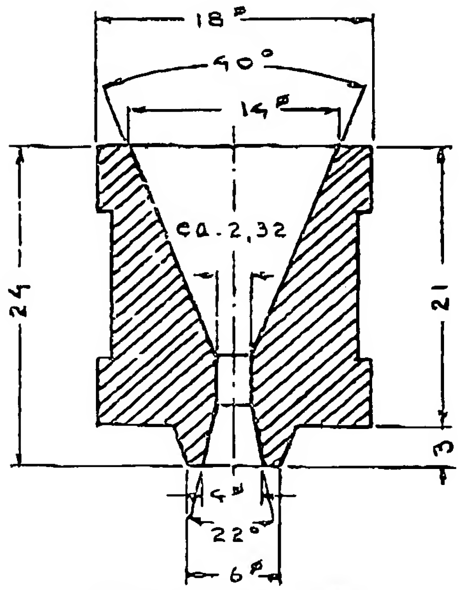

Figure 3 Bottom orifice.

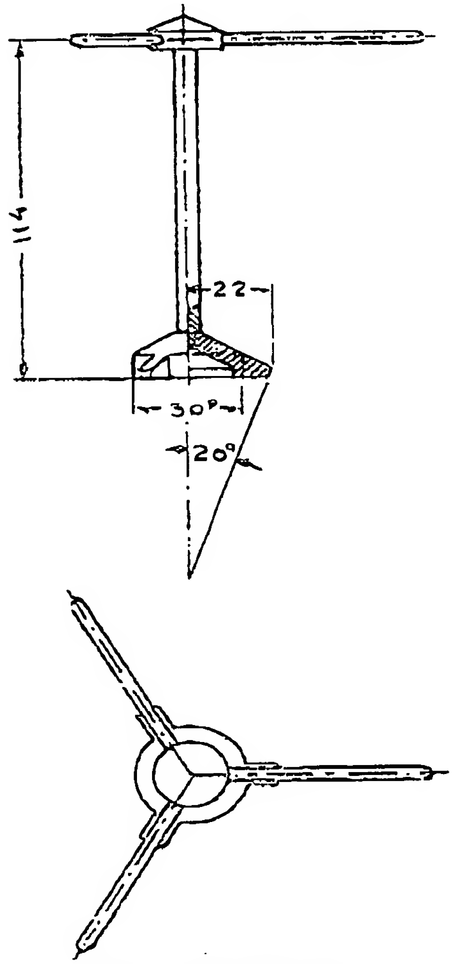

Figure 4. Spreader cone.

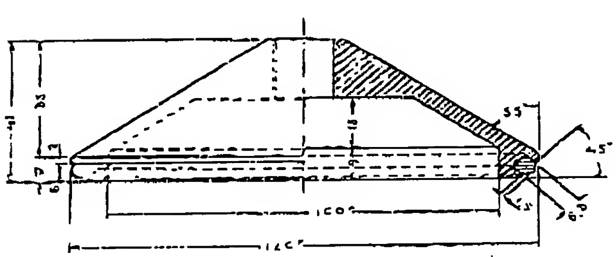

Figure 2. Sealing cone.

Additional information

This method is based on the German Standard method "Merkblatt V/7/61".

Note 1

The Schopper-Riegler test gives acceptable results only if a sufficiently dense mat of fibres is formed on the wire screen. For this reason the test is not recommended for very short-fibred pulps such as those from well beaten hardwood, as most of the fibres may pass through the wire screen and low SR numbers will result although the pulp will drain slowly on the paper machine.

The most reliable results are obtained within the SR number range 10—90.

Note 2

As even small amounts of electrolytes affect the drainage rate considerably, the standard method prescribes water as specified above. If other water is used, the results cannot be considered as complying with the standard procedure and the type of the water should be stated with the test results.

APPENDIX A – DESIGN OF THE SCHOPPER-RIEGLER APPARATUS

The SR apparatus (*Figure* 1) consists of a drainage chamber furnished with a wire screen, a sealing cone and a funnel mounted on a suitable support. All parts are made of non-corroding material.

The drainage chamber is a cylinder with an inside diameter of 137 mm and, at the lower end, a 45° tapering section followed by a cylindrical part with a diameter of 112.9 mm ± 0.1 mm (cross sectional area 100 cm²). The tapering section forms a seating for the sealing cone. The wire screen is made of phosphor bronze and fits tightly into the cylinder 25 mm below the taper. It is plane and is mounted perpendicularly to the cylinder axis, 0.40 mm thick, and has 24 weft and 32 warp meshes per centimetre. The weft strands are 0.17 mm and warp strands 0.16 mm thick.

The sealing cone (*Figure* 2) has an outside diameter of 120 mm and its tapered surface is 55° to the vertical. The sealing cone is fitted to a vertical shaft with an outside diameter of 20 mm. Axially through the sealing cone and the shaft runs a vent with a diameter of 10 mm, which permits the passage of air when the sealing cone is raised. The shaft is provided with two wings diametrically and vertically placed to prevent vortices in the pulp suspension. The seal consists of a rubber ring of 30° Shore hardness. The sealing cone shall be raised at a constant rate of 10 cm/s ± 1 cm/s.

The funnel has an upper conical section, which provides a seating for the drainage chamber and enables the sealing cone to be centered accurately in the chamber. This conical section is followed by a cylindrical section with a cross sectional area of 100 cm² and a height of 35 mm. Near the top of this section there is a vent for equalizing the air pressure. The cylindrical section has three grooves, which fix the location of the spreader cone. The lower part of the funnel is conical with a cone angle of 90.0° and terminates in a separate bottom orifice made of monel metal and with the dimensions given in *Figure* 3. The diameter of the cylindrical section of the bottom orifice is chosen so that 1000 ml of water at 20.0° C ± 0.5° C poured into the funnel drains out in 149 s ± 1 s. This necessitates a diameter of about 2.32 mm (Appendix B).

The side orifice has an inside diameter of 16.0 mm ± 0.1 mm and an outside diameter of 19.0 mm ± 0.1 mm. It penetrates the funnel at 49.0° to the vertical. The upper end of the side orifice is cut at 12.0° to the central axis of the funnel and the overflow edge is as near as possible to the centre of the funnel. In this position the volume between the lower edge of the bottom orifice and the overflow edge of the side orifice is 7.5 ml—8.0 ml. The level of the overflow edge is adjustable. A detachable spreader cone is placed in the funnel to prevent splash from entering the side orifice (*Figure* 4). One of the supporting legs of the spreader cone is placed diametrically to the side orifice.

Measuring cylinder

The measuring cylinder is graduated to give a direct reading of the Schopper-Riegler number, so that a volume of 1000 ml corresponds to zero SR units and a volume of zero ml to 100 SR units. The distance between two graduations should be at least 1.5 mm and corresponds to a volume of 10 ml or one SR unit.

APPENDIX B – CHECKING OF THE SCHOPPER-RIEGLER APPARATUS

The SR apparatus should be checked regularly as follows:

1. Check that the apparatus is properly levelled so that the wire screen is horizontal.
2. Check with a feeler gauge that the gasket on the wire screen fits tightly against the screen so that the effective drainage area is 100 cm².
3. Check that the sealing ring is in good condition. Check also by pouring water into the drainage chamber that the sealing cone fits tightly.
4. Check that the apparatus is clean and free from pitch deposits. If necessary, clean with soap and rinse thoroughly with water. Special attention should be paid to the wire screen. To check that the wire screen is clean, measure the Schopper-

Riegler number for pure water. A value of more than 4 shows that the wire screen needs cleaning. If necessary, clean the screen with acetone and a soft brush and rinse is generously with water. Replace a wire screen that is not in good condition.

5. Check the position of the side orifice in the following way: Close the bottom orifice with a finger. Pour 100 ml of water at 20° C into the funnel. Wait until the excess has escaped through the side orifice. Open the bottom orifice and collect the water leaving the funnel. The volume of the water shall be 7.5 ml—8.0 ml. If this is not the case, adjust the side orifice. Check that the side orifice is in the right position (Appendix A) so that the pressure head is correct.

6. Check the dimension of the bottom orifice. Remove the spreader cone. Close the side orifice with a stopper and fill it by pouring about half a litre of water at 20° C into the funnel while closing the bottom orifice with a finger. After a moment let out the excess water through the bottom orifice. After closing the bottom orifice again refill the funnel with 1000 ml of water at 20.0° C ± 0.5° C and note the time required for the water to drain through the bottom orifice. The time should be 149 s ± 1 s.
If the time is too long the orifice may be widened by honing it with a suitable tool. If the time is too short, the bottom orifice should be replaced. Bottom orifices calibrated by a laboratory authorized by The Scandinavian Pulp, Paper and Board Testing Committee are available from manufacturers of the Schopper-Riegler apparatus.

7. Check that the sealing cone moves with a constant rate of 10 cm/s ± 1 cm/s.

Literature

1. *Hauan, S.:* Norsk Skogindustri *18* (1964): 2, 60—64. Paperi ja Puu — Papper och Trä *46* (1964):3, 97—103. Svensk Papperstidning *67* (1964):8, 325—328.
2. Verein der Zellstoff- und Papier-Chemiker und -Ingenieure: Merkblatt V/7/61.

This method has been published in:
Norsk Skogindustri *19* (1965):2, 62—69. (English and norwegian)
Paperi ja Puu — Papper och Trä *47* (1965):2, 67—78. (English, finnish, swedish)
Svensk Papperstidning *68* (1965):5, 155—158. (Swedish)
Svensk Papperstidning *68* (1965):6, 188—191. (English)

SCAN testing methods are issued and recommended by the Central Laboratories of the Pulp, Paper and Board Industries in Denmark, Finland, Norway and Sweden. Distribution: Secretariat, Scandinavian Pulp, Paper and Board Testing Committee, Drottning Kristinas väg 61, Stockholm Ö., Sweden.

Attachment B
METSÄ-SERLA OY
Res. & Dev.

SCANDINAVIAN PULP, PAPER AND BOARD
TESTING COMMITTEE

SCAN-C21:65

Accepted · July 1965
Identical with SCAN-M4.65

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DRAINABILITY OF PULP BY THE CANADIAN FREENESS METHOD

Definition

The Canadian Freeness (CF) number of a pulp is a measure of the drainability of a supspension of pulp in water, determined and expressed as specified in this method.

Scope

This method applies to any kind of pulp with the limitations indicated in Note 1.

Principle

A known volume of pulp in aqueous suspension is drained through the fibre mat, formed on a screen plate during the test, into a funnel provided with a bottom and a side orifice (*Figure 1*). The filtrate collected from the side orifice is measured in a cylinder, graduated in millilitres. The volume of the filtrate, in millilitres, is the Canadian Freeness number of the pulp.

Apparatus

Canadian Freeness tester of the design and in the condition specified in Appendices A and B.

Preparation of sample

Disintegrate a sample of mechanical pulp as described in SCAN-M 2 and of chemical pulp as described in SCAN-C 18 and dilute the suspension so obtained to approximately 3.2 g per litre. Determine the stock concentration by the procedure in SCAN-M 1 or SCAN-C 17. Avoid the formation of air bubbles in the suspension. Dilute the pulp suspension to 3.00 g ± 0.02 g of oven-dry pulp per litre and adjust its temperature to 20.0°C ± 0.5°C. Throughout the test use distilled, deionized or otherwise purified water that gives results equivalent to those obtained with distilled water (Note 2).

Procedure

Clean the funnel and drainage chamber of the apparatus thoroughly, rinse finally with water and place the drainage chamber in the upper bracket. Adjust the temperature of the apparatus by rinsing it with water at 20.0°C ± 0.5°C. Check that the spreader cone is placed in the grooves in the funnel. Close the bottom lid of the drainage chamber and open the top lid and the air-cock. Place a graduated measuring cylinder beneath the side orifice. While stirring, transfer 1000 ml ± 5 ml of homogenous pulp suspension to a measuring cylinder. Agitate the pulp suspension in the cylinder and pour it rapidly but smoothly into the drainage chamber. Close the top lid and the air-cock. Open the bottom lid. Open the air-cock 5 s after all the pulp suspension has been added. When no more water drips from the side orifice read the volume with the accuracy prescribed in "Report".

Make two determinations on each sample. The results should not differ by more than 4 %. If they do, make another pair of determinations. The number of determinations to be performed may also be calculated as described in SCAN-G 2, Section: "Number of observations".

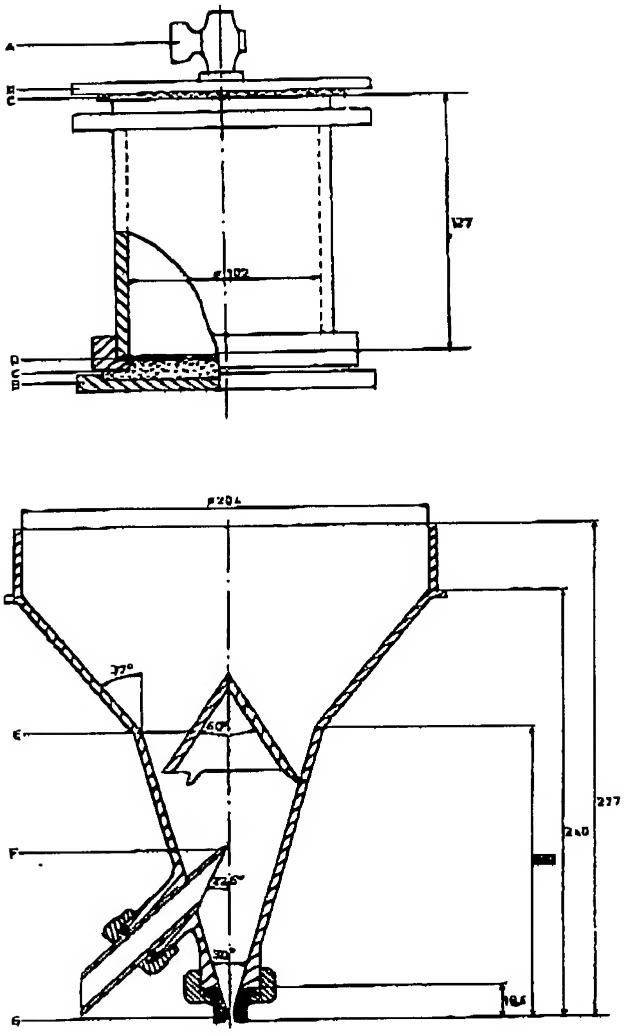

Figure 1.
Draining chamber and funnel

A. Air-cock
B. Lids
C. Rubber gaskets
D. Screen plate
E. Spreader cone
F. Side orifice
G. Bottom orifice

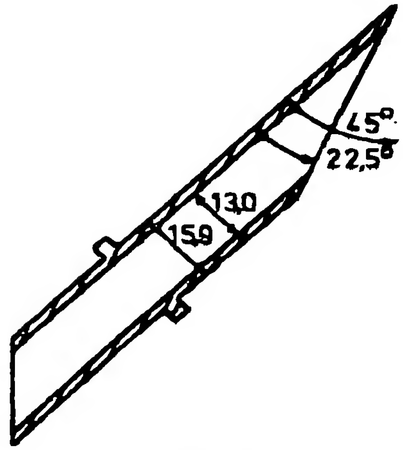

Figure 2.
Side orifice

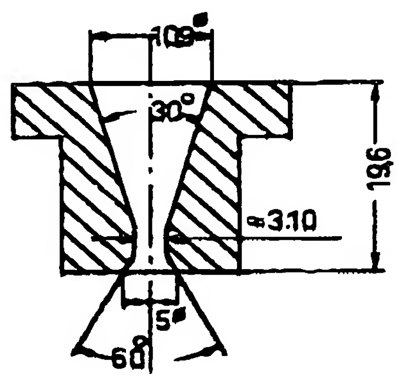

Figure 3.
Bottom orifice

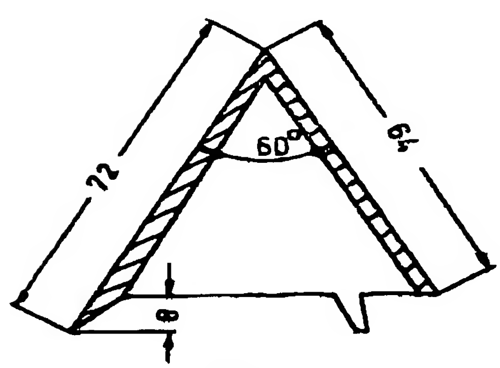

Figure 4.
Spreader cone

Report

For each sample report the mean CF number. Read to the nearest 1 ml for values less than 100 ml, to the nearest 2 ml for values between 100 and 250 ml and to the nearest 5 ml for values over 250 ml. If the sample was received in slush form, state the concentration and the origin of the water used to form the slurry.

If water other than that specified above is used for the test, this fact must be stated with the test results (Note 2).

Additional information

This method is based on the Canadian Standard method CPPA C1 : 62 and should give equivalent results.

Note 1

The Canadian Freeness test gives acceptable results only if a sufficiently dense mat of fibres is formed on the screen plate. For this reason the test is not recommended for very short-fibred pulps such as those from well beaten hardwood, as most of the fibres may pass through the screen plate, and high CF numbers will result although the pulp will drain slowly on the paper machine.

The most reliable results are obtained within the CF number range 50—850.

Note 2

As even small amounts of electrolytes affect the drainage rate considerably, the standard method prescribes water as specified above. If other water is used, the results can not be considered as complying with the standard procedure and the type of water should be stated with the test results.

APPENDIX A — DESIGN OF THE DRAINABILITY TESTER

The tester (Figure 1) consists of a drainage chamber provided with a screen plate, and a funnel, both mounted on a suitable support. All parts are made of non-corroding material.

The drainage chamber is a cylinder, open at the top and fitted with a perforated screen plate at the bottom. It shall be closed by means of lids at top and bottom. The bottom lid is covered with a rubber gasket for sealing against the screen plate and a flange around the lower edge of the cylinder. The top lid has a soft rubber gasket so that the chamber can be closed air-tight and in the centre of the lid is inserted an air-cock to admit air to the cylinder at the start of the test. The cylinder has an inside diameter of 102.0 mm ± 0.1 mm and a height of 127.0 mm ± 0.1 mm from the upper surface of the screen plate to the upper edge of the cylinder. These dimensions give the cylinder a volume of slightly over 1000 ml above the screen plate. The air-cock bore is 4.8 mm ± 0.1 mm. The screen plate has a thickness of 0.5 mm and perforations of 0.5 mm diameter. The perforations are evenly distributed over the surface and the number of holes are 97 per cm^2. The screen plate shall be placed with the burrs downwards. It is calibrated against a SCAN-test master screen plate as described in Appendix B.

The funnel has an upper inside diameter of 204 mm and a total length of 277 mm. The funnel, whose lower cone angle is 30°, has three grooves for fixed location of the spreader cone. All other dimensions are specified in Figure 1.

The side orifice has an inside diameter of 13.0 mm ± 0.1 mm and an outside diameter of 15.9 mm ± 0.1 mm, *Figure* 2. It penetrates the funnel at an angle of 45° to the vertical. The upper end of the side orifice tube is cut at an angle of 22.5° to the centre line of the funnel and the upper edge is so near as possible to the centre line of the funnel. In this position the volume between the lower edge of the bottom orifice and the overflow edge of the side orifice is 24.2 ml ± 0.2 ml. The level of the overflow edge is adjustable.

The bottom orifice *(Figure 3)* has a length of 19.6 mm and such a diameter that 530 ml/min ± 5 ml/min of water at 20.0°C ± 0.5°C leaves the funnel when enough water enters it to maintain a moderate overflow of the excess through the side orifice. This corresponds to a diameter of approximately 3.10 mm. The orifice cones out at the bottom to minimize the effect of damages. Bottom orifice and funnel are concentric and the two pieces fit accurately with flush inside surfaces. A detachable spreader cone is placed in the funnel to prevent splash from entering the side orifice *(Figure 4)*. One of the three supports is placed diametrically to the side orifice.

APPENDIX B — CHECKING OF THE DRAINABILITY TESTER

The tester should be checked regularly as follows:

1. Check that the apparatus is properly levelled so that the screen plate is horizontal.
2. Check that the apparatus is clean and free from pitch accumulations. If necessary, clean with soap and rinse with water.
3. Check that the rubber gasket in the lower lid of the drainage chamber is in perfect condition so that no leakage occurs when water is poured into the chamber.
4. Check that the rubber gasket of the upper lid of the drainage chamber is flawless, well cleaned and elastic so that not more than 0.5 ml of water flows through the screen plate when the lower lid is opened, the upper lid and air-cock being closed.